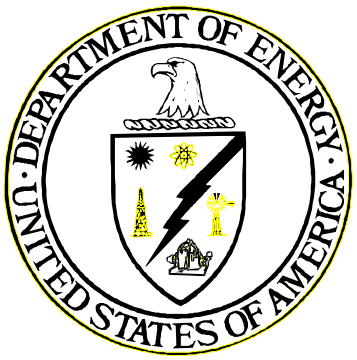
OFFICE OF OVERSIGHT
REVIEW OF NUCLEAR CRITICALITY SAFETY

FIELD REPORT FOR THE
HANFORD PLUTONIUM FINISHING PLANT



January 2000

Office of Oversight
Environment, Safety and Health
U.S. Department of Energy
Washington, DC 20585

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ACRONYMS

ANS	American Nuclear Society
ANSI	American National Standards Institute
CSR	Criticality Safety Representative
DOE	Department of Energy
EH	Office of Environment, Safety and Health
FFS	Fluor Federal Services
FH	Fluor Hanford
NCS	Nuclear Criticality Safety
PFP	Plutonium Finishing Plant
RL	Richland Operations Office

OFFICE OF OVERSIGHT TERMINOLOGY

Noteworthy Practice: An innovative approach or practice related to environment, safety, and health systems, programs, processes, or projects that have proven effective in improving safety management systems and performance, and could be a valuable source of information and lessons learned for other DOE sites.

Positive Attribute: A management system, process, or work practice that demonstrates an effective approach, a positive trend/initiative, or a significant improvement over past performance.

Safety Issue: A condition of concern that could have an adverse impact on the environment, safety, or health of the site, its workers, and/or the public. Safety issues require formal resolution and tracking by line management in accordance with DOE Order 414.1A, *Quality Assurance*.

Weakness: A deficiency in a management system, process, or activity that warrants management attention and corrective action but does not require a formal corrective action plan or tracking under the provisions of DOE Order 414.1A.

Opportunity for Improvement: Suggestions offered by the Office of Oversight appraisal team that may assist line management in identifying options and potential solutions to various issues identified during the conduct of the Oversight appraisal.

EXECUTIVE SUMMARY

In November 1999, the Deputy Secretary of Energy directed a series of actions to strengthen Department of Energy (DOE) nuclear criticality safety (NCS) programs. As one of those actions, a team of criticality safety experts from DOE Headquarters and the field conducted a high-level review at the Hanford Site and four other DOE sites. The review was led by the Office of Oversight, within the Office of Environment, Safety and Health. The purposes of this review were: (1) to identify any immediate problems and related corrective actions, and (2) to determine whether the operations and criticality safety risks at these facilities are well understood, analyzed, and controlled. The review at Hanford focused on the Plutonium Finishing Plant (PFP), which processes solutions of fissile materials, because solutions represent the greatest risk of a criticality accident. The Oversight team observed field implementation of selected operations but did not perform a comprehensive review of implementation of requirements.

Although some weaknesses were identified, the Oversight team did not identify any conditions that presented an immediate risk of a criticality accident involving fissile solutions at PFP at Hanford. The NCS program elements of criticality safety evaluations and controls, work control, change control, and line management oversight are in place and provide assurance that the criticality safety risks at this facility are properly controlled. These four program elements meet the intent of applicable DOE requirements and national standards.

Some aspects of the NCS program at PFP have been enhanced by the initiatives of the Criticality Safety Representative in the facility. For example, as a result of the Criticality Safety Representative program, PFP operators and supervisors demonstrated the ability to easily tie controls to criticality safety evaluation reports and understand contingencies.

The Oversight team did not identify any issues that require a formal corrective action plan. However, eight weaknesses in the application of specific elements of the requirements were identified. The most significant weaknesses involve staff shortages and attrition. For example, the contractor does not currently have a criticality safety program manager to provide leadership at a time when a significant reorganization in the NCS program is ongoing. Table ES-1 summarizes the identified opportunities for improvement.

Table ES-1.
Summary of Opportunities for Improvement

Opportunities for Improvement

- Address staff attrition to ensure the effectiveness of the criticality safety program.
- Ensure formal transfer of information between NCS staff and training staff on changes in criticality safety evaluation reports and postings for operators.
- Increase criticality safety engineers' interactions with operators on the floor.
- Ensure that the Richland Operations Office criticality safety program is formally documented.
- Establish a regular method, such as an NCS committee, to provide feedback to senior management about the effectiveness of the NCS program.
- Implement Fluor Hanford NCS assessments to review the projects' authorization basis processes and a sampling of NCS-related authorization basis products.
- Enhance the capabilities of the PFP-based criticality safety engineers to perform computer-based nuclear criticality safety analysis to reduce the backlog of work on criticality safety evaluation reports.
- Increase the priority for and attention to continuous improvement and training activities.

OFFICE OF OVERSIGHT REVIEW OF NUCLEAR CRITICALITY SAFETY FIELD REPORT FOR THE HANFORD PLUTONIUM FINISHING PLANT

1.0 INTRODUCTION

The Department of Energy (DOE) Office of Oversight, within the DOE Office of Environment, Safety and Health (EH), conducted a review of selected aspects of the nuclear criticality safety (NCS) program at the Hanford Site Plutonium Finishing Plant (PFP). The Oversight review of PFP was one portion of a broader DOE initiative to improve nuclear criticality safety, as directed by the Deputy Secretary of Energy in his November 3, 1999, memorandum entitled "Nuclear Criticality Self-Improvement Initiative." One of the provisions of the Deputy Secretary's memorandum was a review of key facilities at five sites (the other sites were the Y-12 Plant, Los Alamos National Laboratory, the Rocky Flat Environmental Technology Site, and the Savannah River Site) by a team of criticality safety experts led by the EH Office of Oversight.

The site review was conducted January 10-12, 2000 by an eight-person team composed of NCS experts from DOE Headquarters and field offices. Appendix A provides additional information on the composition of the review team.

Consistent with the direction provided by the Deputy Secretary, the purposes of this review were: (1) to identify any immediate problems and related corrective actions, and (2) to determine whether the operations and criticality safety risks at these facilities are well understood, analyzed, and controlled. The Oversight team focused on four key nuclear criticality safety program elements as applied to selected fissile material operations.

The four key nuclear criticality safety elements reviewed were: criticality safety evaluations and controls, work control, change control, and line-management oversight. The criteria for each of these areas were provided by the Deputy Secretary and were derived from the national consensus standard American National Standards Institute (ANSI)/American Nuclear Society (ANS)-8.19, which is required by DOE Order 420.1, *Facility Safety*, and from DOE Policy 450.5, *Line Environment, Safety and Health Oversight*. Appendix B presents the evaluation criteria for the four criticality safety elements.

Fissile nuclear material operations at PFP involve processing, handling, and storage of solutions of fissile materials. Criticality accidents typically involve safety management system breakdowns impacting fissile solution processing. Of the 22 known criticality accidents involving fissile material processing, 21 have involved solutions, including the most recently publicized accident in Tokaimura, Japan.

The common causes of criticality accidents that have occurred to date have been failure to perform a criticality safety evaluation for a process; undetected process and system changes; failure to develop, review, and approve operating procedures; absence of effective worker training; and failure to conform to established procedures and limits. No criticality accident has occurred as a result of a faulty calculation of reactivity, and no known criticality accident has involved storage or transport of fissile material.

The NCS review of the Hanford PFP was conducted according to Oversight protocols and procedures, including the validation of data throughout all stages of the process. The Oversight team toured fissile solution handling and processing operations in the PFP. The review team interviewed DOE Richland Operations Office (RL), Fluor Hanford (FH), and Fluor Federal Services (FFS) personnel. Personnel interviewed included DOE and contractor personnel with

responsibility for NCS, audits and assessments, work planning and control, configuration management, and authorization basis. The Oversight team reviewed a representative sample of operational criticality safety controls (e.g., criticality safety limits summarized in postings and stated in operating procedures), work controls (e.g., other procedural and administrative controls governing normal work tasks, including maintenance, that affect criticality safety), change controls, and audit/self-assessment practices. Selected criticality safety evaluations and other documents that form the basis for these controls and practices were also reviewed.

This Oversight review focused exclusively on criticality safety aspects of PFP. Consequently, the review does not constitute an assessment of the overall NCS program relative to the requirements of the ANSI/ANS standards and DOE Order 420.1, *Facility Safety*. The elements of ANSI/ANS Standard 8.19 were applied to only those specific processes selected for review. Further, the Oversight team had only limited opportunity to observe actual work in progress during the field visit because the review was conducted according to an accelerated schedule and because few operations were ongoing during the period of the review. The review therefore focused primarily on interviews, documentation, records, and observation of the work place.

2.0 RESULTS

The Oversight team noted one positive attribute and eight weaknesses in the application of specific elements of the requirements. No issues were identified that require a formal corrective action plan in accordance with DOE Order 414.1A, *Quality Assurance*.

2.1 Positive Attributes

1. **The PFP facility NCS program is much improved since the EH review in 1998 and functioning well due in large part to conscientious operators and CSRs**.

Hanford has implemented a Criticality Safety Representative (CSR) function at all Hanford facilities with an NCS program. The CSR program has been particularly effective at PFP in providing liaison with the NCS staff, communicating with operators, applying NCS controls, and overseeing the NCS program at the facility. The informal FFS brown bag lunch training sessions are an inexpensive way to provide continuous professional development for NCS staff. Operators and supervisors demonstrated the ability to easily tie controls to criticality safety evaluation reports and understand contingencies. FFS established a procedure for development and implementation of criticality controls that facilitates Operations' understanding of the bases for these controls.

2.2 Weaknesses

Although not requiring a separate, formal response in accordance with DOE Order 414.1A, the following weaknesses warrant management attention and appropriate corrective actions. In discussions with the Office of Oversight, the site has agreed to include these weaknesses in their site self-assessment, which is a required element under the Deputy Secretary's NCS self-improvement initiative. The site will track the weakness and corresponding corrective actions in site-level corrective action tracking systems.

1. Staff attrition is impacting the criticality safety program.

The contractor does not have a criticality safety program manager. The FH criticality safety program manager recently resigned, leaving a gap in leadership for the NCS program. The lack of leadership could exacerbate the difficulties associated with the ongoing development of plans for an FH NCS staff reorganization. Although the NCS program has improved since the May 1998 NCS review by EH, the proposed changes in the NCS program could slow or reverse the improving trend in the NCS program at Hanford.

In addition, the highly qualified and effective primary CSR at PFP recently resigned. PFP recently hired a second CSR; however, the second CSR is not likely to be fully qualified before the first CSR leaves. Also, interviews indicate that the workload is such that having only one CSR will not be adequate staffing. This loss of the primary CSR could impact program effectiveness because the outgoing CSR had a particularly good understanding of operations and rapport with the operators. Management attention will be needed to ensure that processes are improved and institutionalized to compensate for the loss of this key person and to ensure continued regular interactions between operators and NCS personnel.

2. NCS training on changes in criticality safety evaluation reports and postings for operators is taught by the PFP training division without formal documented input from the CSR or the criticality safety engineer.

The PFP Training Division provides NCS training to operators on changes in criticality prevention specifications and postings. Interviews indicated that input from the CSR and the assigned criticality safety engineers to the PFP Training Division is minimal. Without adequate input, it is not clear how PFP management ensures that the proper information is communicated to the operators or how the trainer ensures that the information is correct and current. Despite the absence of a formal connection with the PFP Training Division, the CSR has taken the personal initiative to communicate the necessary information to operators, partially mitigating this weakness. However, the primary CSR at PFP will leave in the near future, highlighting the need for formal connections between the training division and NCS personnel.

3. The criticality safety engineers do not interact enough with operators on the floor.

Interviews with the NCS staff revealed that the RL-based criticality safety engineers rarely observe operations or attend pre-job briefs, while PFP-based criticality safety engineers are not proactive in interacting with operators or observing ongoing operations. The PFP-based criticality safety engineers primarily respond to requests to support Operations. One symptom of the insufficient interaction is that operators interviewed could not name the current onsite criticality safety engineer. This situation is particularly important given the impending loss of the primary CSR at PFP. With current practices, the criticality safety engineers are not learning about the fissile processes and operating practices at the facility.

4. The RL criticality safety program is not formally documented.

Although the program is not yet formally documented, the DOE Criticality Safety Program Manager has drafted what appears to be an adequate program plan for overseeing the contractor criticality safety program and has begun implementing it. The DOE Assistant Manager for Engineering and Standards is reviewing the plan and has expressed strong support for criticality safety.

5. The contractor, FH, does not have a regular method, such as an NCS committee, to provide feedback to senior management about the effectiveness of the NCS program.

Interviews indicate that the contractor performs self-assessments in accordance with HNF-PRO-548, Rev 2, and uses the Facility Evaluation Board to assess certain aspects of criticality safety on a periodic basis. FH has an independent assessment function that occasionally uses subcontractors to review NCS, typically in response to DOE NCS reviews. However, the contractor has not established and chartered a criticality safety committee to advise upper-level management about criticality safety. If chartered appropriately, such a committee would fulfill an important technical advisory function and provide an internal base of expertise that can be augmented with outside experts to perform periodic assessments. As noted in the May 1998 EH review of NCS, the Facility Evaluation Board reviews do not have the breadth, depth, or frequency needed to properly assess NCS in the facilities and to advise FH management on the status of the NCS programs. Although some programs are in place, there is no regular internal FH NCS program review function that advises senior FH management on the needs of the NCS program.

6. FH NCS does not assess the authorization basis process or review the authorization basis products related to NCS that are developed by the projects.

All authorization basis products flow directly from the projects to RL without internal review by the FH NCS staff. Projects at Hanford are diverse and physically separated. The projects utilize their own subcontracted NCS staff and internal CSRs to provide NCS analyses supporting the authorization basis. Without FH NCS involvement, there is no assurance that the projects are producing authorization basis documents conforming to the expectations of FH. This situation increases the potential for inconsistencies in addressing the NCS program and controls in the authorization basis documents.

7. There is not a validated computer platform at PFP for the PFP-based criticality safety engineers to use to reduce the backlog of work on criticality safety evaluation reports.

There is a backlog of criticality safety evaluation reports needing work that the PFP-based criticality safety engineers could perform if they had a validated computer platform to perform calculations. Without such a capability, the criticality safety engineers cannot contribute to reducing the backlog.

FFS personnel indicated that the role of the field-based criticality safety engineers is different from that of criticality safety engineers stationed at RL. The criticality safety engineers based at the PFP primarily monitor day-to-day operations, while the criticality safety engineers stationed at RL perform computer calculations for criticality safety and write evaluations documenting the results of these calculations and other analysis products.

8. Continuous improvement and training activities do not receive appropriate priority and funding in some cases.

The present system for developing criticality safety evaluation reports is geared primarily to new projects or changes to existing activities. Onsite criticality safety engineers are reviewing some older criticality safety evaluation reports, but there is no concerted effort to update legacy NCS controls. Some of the controls for similar operations appear inconsistent and lack a reasonable technical basis. For example, operators question the validity of spacing limits. Many of these limits and their associated postings are drawn from historical criticality safety evaluation reports and have a basis in contingency analysis (i.e., probability of occurrence) rather than in physical principles. There appears to be no process in place for identifying and prioritizing improvements in legacy NCS controls.

The Oversight team noted examples at PFP where funding and management attention to continuous improvement appeared to be lacking. For example, for many years PFP has been using modified "toy" wagons to transport containers of fissile material. PFP has been replacing these wagons with flat-bed carts that represent a significant improvement in criticality safety. No one who was interviewed could explain the delay in accomplishing this relatively minor change. Criticality safety engineers said that there was small amount of funding available to make NCS controls more consistent. Criticality safety engineers also indicated that funding shortfalls necessitated halting work on non-essential criticality safety evaluation reports for the last four months of the previous fiscal year. The PFP NCS Program Manager confirmed that approximately $500K was available this fiscal year as discretionary NCS funding not tied to projects. However, these funds are required to cover more than continuous improvement and updating to outmoded criticality safety evaluation reports, such as response to regulatory findings, infractions, and changes in procedures.

The travel allocation has been limited, so offsite training for CSRs and FH NCS staff has not been possible. Without such funding, the FH NCS staff cannot be qualified to the DOE Training and Qualification Standard (DOE-STD-1135-99) implemented in response to Defense Nuclear Facilities Safety Board Recommendation 97-2. In addition, the projects do not provide funding for FFS staff and CSRs to participate in the brown bag lunch seminars. The team observed the NCS Center of Excellence meeting and noted that only one criticality safety engineer was present; funding has not been allocated to allow the criticality safety engineers to participate in the Center of Excellence. Similarly, funding for professional development activities for CSRs (e.g., ANS Nuclear Criticality Safety Division Meetings, the Los Alamos National Laboratory NCS course, University of New Mexico NCS courses) has been relatively limited, considering the important role CSRs play in the development and implementation of the NCS programs at the facilities.

3.0 CONCLUSIONS AND OPPORTUNITIES FOR IMPROVEMENT

Based on the Oversight review, there are no imminent criticality safety hazards at the Hanford PFP. The NCS program elements that were reviewed (i.e., criticality safety evaluations and controls, work control, change control, and line management oversight) are in place and provide assurance that the criticality safety risks at this facility are properly controlled. These four program elements meet the intent of applicable requirements of Section 4.3 of DOE Order 420.1, ANSI/ANS-8.19, and DOE Policy 450.5.

No issues were identified that require a formal corrective action plan. However, eight weaknesses in the application of specific elements of the requirements were identified. The following opportunities for improvement should be considered to address the identified weaknesses.

1. Address staff attrition to ensure the effectiveness of the criticality safety program (see Weakness #1).

- Hire an FH criticality safety manager as soon as possible and provide the necessary support to implement the program.
- Hire and train a second CSR to support PFP. In the interim, require the field-based criticality safety engineers to perform similar duties.
- Ensure that the qualification program for the CSR emphasizes the need for continuous open dialogue with and support to operators at PFP.

2. Ensure formal transfer of information between NCS staff and training staff on changes in criticality safety evaluation reports and postings for operators (see Weakness #2).

- Ensure that the criticality safety evaluation report change process includes interaction among criticality safety engineers, CSRs and the training staff to identify information needed by the operators to implement the changes.

3. Increase criticality safety engineers' interactions with operators on the floor (see Weakness #3).

- Ensure that RL-based criticality safety engineers spend more time on site.
- Ensure that PFP-based criticality safety engineers attend appropriate pre-job briefs, observe ongoing operations, and be otherwise proactive in communicating with operators.

4. Ensure that the RL criticality safety program is formally documented (see Weakness #4).

- Expedite review and approval of the RL criticality safety program plan.

5. Establish a regular method, such as an NCS committee, to provide feedback to senior management about the effectiveness of the NCS program (see Weakness #5).

- Charter and adequately fund a NCS committee to advise senior management on criticality safety policy, review criticality safety issues, and perform annual NCS program assessments.

6. Implement FH NCS assessments to review the projects' authorization basis processes and a sampling of NCS-related authorization basis products (see Weakness #6).

- Structure the review process for criticality analyses contained in the authorization basis documents to include the FH NCS staff.

- Implement an FH authorization basis assessment program that periodically reviews the authorization basis process and products developed by the projects that deal with criticality safety to ensure consistency and adequacy.

7. Enhance the capabilities of the PFP-based criticality safety engineers to perform computer-based nuclear criticality safety analysis to reduce the backlog of work on criticality safety evaluation reports (see Weakness #7).

- Provide the field-based criticality safety engineers with a validated computer platform so that they can perform calculations.

8. Increase the priority for and attention to continuous improvement and training activities (see Weakness #8).

- Ensure that PFP-based criticality safety engineers regularly take time to identify legacy controls that appear inconsistent and provide training to operators on their bases.

- Make more resources available for identifying and prioritizing historical criticality safety evaluation reports for revision and/or update.

- Develop a risk reduction-based approach to prioritizing and implementing improvements in the criticality safety program.

- Utilize PFP-based criticality safety engineers to perform continuous improvement activities, such as updating criticality safety evaluation reports and controls not directly tied to projects.

- Allocate adequate funds to encourage exchange of NCS information at the site level and to support the training of the criticality safety staff.

- Provide training and professional development activities for FH NCS staff and CSRs.

- Ensure that funding is adequate to enable the FH NCS staff to qualify according to DOE-STD-1135-99.

APPENDIX A

TEAM COMPOSITION

The team membership, composition, and responsibilities are as follows:

Deputy Assistant Secretary for Oversight

S. David Stadler, Ph.D.

Associate Deputy Assistant Secretary for Oversight

Raymond Hardwick

Team Leader

Jerry McKamy, Ph.D.

Management Advisor to the Team

Ed Blackwood

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Adolf Garcia
Jim Felty

Work and Change Control Subgroup

Bill Weaver
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Steve Payne, Ph.D.
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Quality Review Board

Raymond Hardwick
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Tom Davis

APPENDIX B

EVALUATION CRITERIA

INTRODUCTION

This appendix presents the evaluation criteria used in this Oversight review. It also presents the lines of inquiry (i.e., the specific areas of focus within each criterion) that correspond to each of the criteria. The criteria and lines of inquiry are presented for each of the four safety management areas reviewed by Oversight:

1. Criticality safety evaluations and controls
2. Work control
3. Change control
4. Line-management oversight.

Most of the evaluation criteria and lines of inquiry (i.e., criteria 1.1 through 4.4) for this Oversight review apply primarily to the contractors that implement NCS programs at DOE sites. These criteria and lines of inquiry were derived from the consensus standard ANSI/ANS-8.19, which is established as a DOE requirement by provisions of DOE Order 420.1.

Certain criteria (i.e., criteria 4.5 through 4.10) apply only to the DOE Operations Office and Site Office. The criteria and lines of inquiry that apply to DOE organizational elements were extracted from DOE P 450.5, *Line Environment, Safety and Health Oversight*.

1. CRITICALITY SAFETY EVALUATION AND CONTROLS

1.1 Criterion: Before starting a new operation with fissile materials or before an existing operation is changed, it shall be determined that the entire process will be subcritical under both normal and credible abnormal conditions. (ANSI/ANS-8.19, Section 8.1)

Lines of Inquiry:

- Criticality safety evaluations shall conform to the requirements of ANSI/ANS-8.1, "Nuclear Criticality Safety in Operation with Fissionable Material Outside Reactors."
- The NCS staff, responsible operations personnel, and responsible support engineering personnel jointly develop contingencies.
- All credible process upsets are considered and are either controlled or dispositioned appropriately. NCS staff familiar with the facility and operations under consideration perform the criticality safety evaluations. The NCS Staff works as a team with operations to develop credible accident scenarios and controls.

1.2 Criterion: The nuclear criticality safety evaluation shall determine and explicitly identify the controlled parameters and their associated limits upon which nuclear criticality safety depends. (ANSI/ANS-8.19, Section 8.2)

Lines of Inquiry:

- Controls are developed in the criticality safety evaluation for each contingency.
- Controlled parameters, contingencies, and credited barriers are explicitly documented.

1.3 Criterion: The nuclear criticality safety evaluation shall be documented with sufficient detail, clarity, and lack of ambiguity to allow independent judgment of results. (ANSI/ANS-8.19, Section 8.3)

Lines of Inquiry:

- The criticality safety evaluations (CSEs) contain a system/process description with enough detail for an independent reviewer to understand the system/process sufficiently to judge the results of the criticality safety analysis. The criticality safety evaluations conform to DOE-STD-3007-93, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*.
- All assumptions are fully documented in the criticality safety evaluation.
- The criticality safety evaluation can be read and understood by the line supervision.

1.4 Criterion: Before starting operation, there shall be an independent assessment that confirms the adequacy of the nuclear criticality safety evaluation. (ANSI/ANS-8.19, Section 8.4)

Lines of Inquiry:

- All criticality safety evaluations receive an independent technical peer review before approval for use.
- There is a process for confirming that all credited engineered features of a system or process are in place and meet the specifications anticipated by the evaluation prior to starting operations.

1.5 Criterion: Procedures shall include those controls and limits significant to the nuclear criticality safety of the operation. (ANSI/ANS-8.19, Section 7.2)

Lines of Inquiry:

- Criticality controls are included in operating procedures.
- The criticality controls are clearly identified as important to safety.

1.6 Criterion: Procedures should be supplemented by posted nuclear criticality safety limits or limits incorporated in operating check lists or flow sheets. (ANSI/ANS-8.19, Section 7.6)

Lines of Inquiry:

- Criticality safety postings are easy to understand by operators.
- Postings contain only information controlled by the operator performing the task.
- The relationship of controls in postings to controls in procedures is clear.
- Postings are easy to read from normal operator positions at the workstation.
- Operations personnel and NCS staff validate draft criticality postings and controls prior to implementation.

CHANGE CONTROL PRACTICES

2.1 Criterion: Supervisors shall verify compliance with nuclear criticality safety specifications for new or modified equipment before its use. Verification may be based on inspection reports or other features of the quality control system. (ANSI/ANS-8.19, Section 5.5).

Lines of Inquiry:

- There are procedures or mechanisms in place and effective to ensure that modifications to equipment and/or processes results in a review of the applicable CSEs-procedure-posting set prior to implementing the modification.
- There is a process for ensuring that no new or modified operation is started until all applicable verification steps have been performed which includes presence of approved CSEs, postings, procedures and that no criticality infraction will result from startup.
- A process is in place to verify that as-built equipment and processes conform to the configuration anticipated in the CSE.
- Maintenance work orders that have the potential to impact criticality safety are reviewed by the NCS Staff and a USQD is performed prior to performing the maintenance tasks.

2.2 Criterion: Active procedures shall be reviewed periodically by supervision. (ANSI/ANI-8.19, Section 7.4)

Lines of Inquiry:
- Procedures are periodically reviewed.
- The NCS Staff periodically participate in reviews of active operating procedures.
- The Authorization Basis (SAR, basis for interim operations, etc.) is reviewed periodically by the NCS Staff for changes that potentially impact nuclear criticality safety.

2.3 Criterion: New or revised procedures impacting nuclear criticality safety shall be reviewed by the nuclear criticality safety staff. (ANSI/ANS-8.19, Section 7.5)

Lines of Inquiry:
- New or revised procedures are reviewed by the NCS Staff.
- Proposed changes to the Authorization Basis (SAR, basis for interim operations, etc.) affecting nuclear criticality safety are reviewed by the NCS Staff.

WORK CONTROL PRACTICES

3.1 Criterion: Each supervisor shall provide training and shall require that the personnel under his supervision have an understanding of procedures and safety considerations such that they may be expected to perform their functions without undue risk. Records of training activities and verification of personnel understanding shall be maintained. (ANSI/ANS-8.19, Section 5.3)

Lines of Inquiry:
- At a minimum, operators receive criticality safety training in accordance with ANSI/ANS-8.20, "Nuclear Criticality Safety Training."
- Supervisors provide job specific training on procedures.
- Pre-job briefs cover criticality controls specific to the operations at hand.
- Plan-of-the-day meetings address criticality safety related topics like work restrictions due to criticality safety infractions, availability of new procedures and postings, need for NCS Staff participation, results of recent criticality safety assessments/surveillances, etc.
- Supervisors maintain training records for their personnel.
- Supervisors and operators can answer questions about the basic criticality controls for their operations.
- Supervisors can generally describe the contingencies and controls for the contingencies for their operations, including credited engineered features and key facility assumptions, if any.

3.2 Criterion: Supervisors shall develop or participate in the development of written procedures applicable to the operations under their control. Maintenance of these procedures to reflect changes in operation shall be a continuing supervisory responsibility. (ANSI/ANS-8.19, Section 5.4)

Lines of Inquiry:
- All fissile material handling operations are performed according to approved procedures.
- Operations personnel or supervision are involved in developing procedures.
- There is a mechanism to assure that only current, approved procedures, CSEs, and postings are used for operations.
- The line program supervisor has a formalized process that authorizes work only after all NCS requirements have been met subsequent to modifications of the existing set of controls/procedures.
- There is a mechanism to ensure that OSR related controls and requirements in procedures or postings are not changed without proper analysis by the NCS Staff and approval by management.
- Unreviewed Safety Question Determinations (USQDs) are performed for all procedure modifications.

3.3 Criterion: The nuclear criticality safety staff shall provide technical guidance for the design of equipment and processes and for the development of operating procedures. (ANSI/ANS-8.19, Section 6.1).

Lines of Inquiry:
- The NCS Staff provides design input for all new or modified equipment.
- The NCS Staff reviews all operating procedures involving fissile materials.
- The NCS Staff reviews and concurs on final equipment and process designs.
- The NCS Staff reviews maintenance work orders that potentially affect criticality safety.

3.4 Criterion: The NCS staff shall maintain familiarity with all operations within the organization requiring nuclear criticality safety controls. (ANSI/ANS-8.19, Section 6.4)

Lines of Inquiry:

- The NCS staff observes fissile material handling and processing operations regularly.
- The NCS Staff attends operations planning meetings for new or restarted processes.
- The NCS Staff has access to, and familiarity with, fissile material operating procedures.
- The NCS Staff attends pre-job briefs and plan-of-the-day meetings when it is appropriate.
- The NCS Staff maintains familiarity with reports of deviations from expected process conditions even if these deviations do not result in a criticality infraction.

OVERSIGHT, AUDIT AND SELF-ASSESSMENT PRACTICES

4.1 Criterion: Management shall periodically participate in auditing the overall effectiveness of the nuclear criticality safety program. (ANSI/ANS-8.19, Section 4.6)

Lines of Inquiry:

- Contractor management participates in review teams or committees that assess facility criticality safety programs.
- Contractor program/facility management routinely audits operations for compliance with criticality safety requirements. Contractor performs NCS management self-assessments of their criticality safety staff and program.

4.2 Criterion: Management may use consultants and nuclear criticality safety committees in achieving the objectives of the nuclear criticality safety program. (ANSI/ANS-8.19, Section 4.7)

Lines of Inquiry:
- Management utilizes a nuclear criticality safety committee to assist in monitoring and improving the criticality safety program.
- Nuclear criticality safety committees report directly to the Senior Management.
- Personnel interviews indicate that findings from the nuclear criticality safety committee, or equivalent, are entered into a tracking database and corrective actions are tracked through implementation.
- Outside consultants are utilized to provide an independent viewpoint on the overall criticality safety program.

4.3 Criterion: The [NCS] staff shall conduct or participate in audits of criticality safety practices and compliance with procedures as directed by management. (ANSI/ANS-8.19, Section 6.6)

Lines of Inquiry:
- The NCS Staff participates in periodic audits of operations and procedures.
- The results of audits are shared among the NCS Staff.
- The results of audits are reported to appropriate Facility Management.
- Corrective actions are developed for Opportunities for Improvement.

4.4 Criterion: Operations shall be reviewed frequently (at least annually) to ascertain that procedures are being followed and that process conditions have not been altered so as to affect the nuclear criticality safety evaluation. (ANSI/ANS-8.19, Section 7.8)

Lines of Inquiry:
- All operations are reviewed at least annually.
- Annual reviews determine that procedures are being followed.
- Audits and reviews monitor the configuration of the facility and processes which could adversely affect criticality safety, such as movements of criticality detectors, installation of new equipment, inoperable emergency enunciators, etc.
- Personnel with NCS experience and knowledge of the operations perform the reviews.
- The reviews examine CSEs to verify that changes to the process have not compromised criticality safety.
- The results of the review are reported to senior management as well as Facility and Program Management.
- Opportunities for Improvement and proposed corrective actions are documented and tracked to closure.
- Procedures are in place to ensure that changes to process equipment over time do not degrade compliance with criticality safety controls.
- Annual reviews are conducted of facilities and operations where it has been determined that criticality is not credible but that contain more than a minimum critical mass of fissile material and/or that still require criticality safety controls.

4.5 Criterion: DOE must acquire and maintain sufficient knowledge of program activities in order to make informed decisions on criticality safety resources for these activities. (DOE P 450.5, Policy section)

Lines of Inquiry:
- Routine meetings are held with contractor NCS management.
- Periodic meetings are held with DOE contractor operations management?
- The DOE NCS Program Manager reviews budget requests made by contractor NCS management.
- The DOE NCS Program Manager reviews budget requests made by contractor operations management.
- The DOE NCS Program Manager has input to the DOE site budget process.

4.6 Criterion: DOE maintains operational awareness of contractor work activities, typically through DOE line managers and staff such as Facility Representatives and criticality safety subject matter experts. (DOE P 450.5, paragraph 2a)

Lines of Inquiry:
- The DOE NCS Program Manager and Facility Representatives work closely on NCS-related issues in the field.
- The DOE NCS Program Manager routinely spends time in the field performing walkdowns and interacting with Operations.
- The DOE NCS Program Manager reviews contractor occurrence reports related to criticality safety programs.

4.7 Criterion: DOE reviews performance against formally established criticality safety performance measures, performance indicators, and contractor self-assessments. (DOE P 450.5, paragraph 2b)

Lines of Inquiry:
- Performance measures are established for the contractor NCS program.
- Progress on the performance measures is routinely reported to DOE.
- Contractor NCS self-assessments are reviewed by the DOE NCS Program Manager.
- The NCS Program Manager provides reports and feedback on contractor self-assessments to senior DOE site management.

4.8 Criterion: DOE performs criticality safety reviews and assessments in support of required readiness assessments, Operational Readiness Reviews, Safety Management System documentation and onsite verification reviews, and authorization basis documents including Criticality Safety Evaluations (CSEs). (DOE P 450.5, paragraph 2c)

Lines of Inquiry:

- The DOE NCS Program Manager participates in readiness assessments, Operational Readiness Reviews, and Integrated Safety Management reviews when necessary.
- The DOE NCS Program Manager participates in the review and approval of facility NCS-related authorization basis documents (e.g., Safety Analysis Reports, Bases for Interim Operations, Unresolved Safety Questions, and Technical Safety Requirements).
- The DOE NCS Program Manager reviews a sample of contractor CSEs on a routine basis.

4.9 Criterion: DOE performs periodic appraisals of the contractor criticality safety program, including for-cause criticality safety reviews, as necessary. (DOE P 450.5, paragraph 2d)

Lines of Inquiry:

- Surveillances of facility criticality safety programs and controls are incorporated into the Field Office assessment plan.
- Appraisals and reviews are documented.
- Corrective actions are tracked to closure.
- The DOE NCS Program Manager performs assessments of the contractor criticality safety program in accordance with a documented plan.
- Outside DOE NCS subject matter experts are occasionally utilized to assist with reviews to provide independent feedback.

4.10 Criterion: DOE has a designated focal point for coordinating criticality safety oversight activities. (DOE P 450.5, paragraph 2)

Lines of Inquiry:

- The DOE Field Office has designated a single NCS focal point (i.e., NCS Program Manager).
- The DOE NCS Program Manager has been qualified by completing the requirements in the Federal NCS Qualification Standard.
- The DOE NCS Program Manager routinely meets with an Assistant Field Office Manager responsible for NCS.
- The DOE NCS Program Manager represents the single point of contact on NCS issues for the contractor.
- The DOE NCS Program Manager represents the Field Office on the Criticality Safety Coordinating Team (CSCT).